National Institute of Environmental Health Sciences

Climate change and heat-related mortality in six cities part 1: Model construction and validation

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Year: 2007
Journal: International Journal of Biometeorology. 51 (6): 525-540

Abstract:

Heat waves are expected to increase in frequency and magnitude with climate change. The first part of a study to produce projections of the effect of future climate change on heat-related mortality is presented. Separate city-specific empirical statistical models that quantify significant relationships between summer daily maximum temperature (T (max)) and daily heat-related deaths are constructed from historical data for six cities: Boston, Budapest, Dallas, Lisbon, London, and Sydney. 'Threshold temperatures' above which heat-related deaths begin to occur are identified. The results demonstrate significantly lower thresholds in 'cooler' cities exhibiting lower mean summer temperatures than in 'warmer' cities exhibiting higher mean summer temperatures. Analysis of individual 'heat waves' illustrates that a greater proportion of mortality is due to mortality displacement in cities with less sensitive temperature-mortality relationships than in those with more sensitive relationships, and that mortality displacement is no longer a feature more than 12 days after the end of the heat wave. Validation techniques through residual and correlation analyses of modelled and observed values and comparisons with other studies indicate that the observed temperature-mortality relationships are represented well by each of the models. The models can therefore be used with confidence to examine future heat-related deaths under various climate change scenarios for the respective cities (presented in Part 2).

Source: http://dx.doi.org/10.1007/s00484-007-0092-9

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Temperature

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Ocean/Coastal, Urban

Geographic Location:

resource focuses on specific location

Non-United States, United States

Non-United States: Australasia, Europe

European Region/Country: European Country

Other European Country : Hungary; Portugal; United Kingdom

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Morbidity/Mortality

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Time Scale Unspecified